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ABSTRACT

Arguing that the concept of causality in human experience is archaic, unnecessary, and misleading, particularly in the social/behavioral sciences, a new plausibility approach is proposed for understanding relationships among entities. The epistemological history of causality includes positivist, deductive-nomological, essentialist, activity or manipulability, and probabilistic approaches. It is proposed that the concept of causality is poorly established and that it has proven to be impossible to divest the concept of causality of influences depending on human experience, judgment and insight. The tendency to describe causality as attributional is examined. It is proposed that the causality concept be replaced with the concept of plausibility; that understanding be substituted for prediction and control. It is argued that plausibility is consistent with naturalistic inquiry and obviates problems with conventional causality formulations. It is suggested that preliminary criteria for determining when a plausibility assertion is sufficiently persuasive should include groundedness in a situation, internal consistency, confirmability and wholism. The proposed argument is applied to the use of interventions for the alleviation of educational problems. (CM)

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CAUSALITY VS. PLAUSIBILITY:

ALTERNATIVE STANCES FOR INQUIRY INTO HUMAN BEHAVIOR

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The concept of causality is one of the most ancient and pervasive in human experience. Yet it will be the thesis of this paper that that concept is archaic, unnecessary, and misleading, particularly in the social/behavioral sciences. We shall briefly review its epistemological history, and propose a new approach which, we believe, avoids the problems associated with traditional formulations and provides a more powerful perspective from which relationships among entities can be understood. Before dealing with these matters, however, we shall make a brief excursion to consider why the idea of causality has such a tenacious grip on our intellect, and we shall dispose of the contention that we are dealing with a straw man since, as it is claimed, no sophisticated researcher continues to rely on the notion of causality as conventionally expressed.

One may well ask why the history of inquiry is characterized by such an obsessional preoccupation with causality. Answers are not difficult to come by. It has long been an aim of science to achieve control; the understanding of causes seems to be the key to control of effects. The development of interventions (an activity with which education seems to be especially involved these days) depends on causal notions; interventions (causes) are designed in ways that will eliminate undesirable states of affairs (effects) and/or substitute desirable ones. Further, insofar as science is deterministic, that is, holds that natural events are invariantly lawful, knowledge of causes and their effects is central; if it could be shown that the concept of causes is deficient, the assumption of determinism would rest on shaky ground indeed. Finally, without viable causes, the hope for a nomothetic science would be vain.

These reasons may explain why scientists have become enamored of the causality concept, but there are other reasons for our causality

fetish that transcend the scientific realm. If causes are the key to control, knowledge of causes is tantamount to power. This fact may help us to understand why politicians have, in recent years, been willing to support scientific research, in the hope that such inquiry will produce information which can be used to good political effect. It may also explain their impatience when the inquiry does not produce immediate results.

Even more fundamental than science and politics, however, is the idea that the drive to develop causal explanations is deep-seated in the very genetic and psychological make-up of humans. Cook and Campbell (1979), for example, describe themselves as holding a "critical-realist" perspective which is "biological evolutionary" in character:

> From the evolutionary perspective . . . humanity's strong and stubborn psychological predispositions to infer causal relations . . . can be seen as the product of a biological evolution of brain-mind processes, which has resulted in a psychic unity concerning causation. (p. 28; emphasis added)

Similarly, Robert Oppenheimer is said to have believed that "the need to understand cause constituted the third major drive of human beings after self-preservation and the preservation of the species." (Cited in Frasher and Frasher, 1979, p. 2) Michotte (1963) builds on Piaget's idea that the concept of causality develops early in children (in two stages: phenomenalism, in which links are established without knowledge, e.g., the pebble sinks because it is white, and efficacy, in which knowledge of the effort needed to produce the effect is appreciated) to undergird his own notion that one's experience with the world leads to a belief in causality. Travers (1981) suggests that Kant "held that cause is a way of thinking about the world that is built into our minds. It is subjectively, and not objectively, derived." (p. 32, emphasis added) Bertrand Russell (1913) asserted that the term cause embodied elements of "primitive animism."

Despite these compelling reasons for accepting the concept of causality as essential, and indeed, almost genetically determined, there are many difficulties with it. The epistemological literature abounds with criticisms of each of the formulations that have been proposed (more of this below). As a result, researchers have become wary of exhibiting unbridled enthusiasm for it, and indeed, some researchers assert that arguments about causality amount to beating a dead horse. Thus Travers (1981), for example, claims:

> Discussions of causal relationships in research are pre-Newtonian. . . .
>
> Modern scientists do not use the concept of cause, except during chatty moments. Current psychological literature does not use the concept of cause, and substitutes have been offered. One substitute is the idea of functional relationship. At least that term manages to avoid the difficulties that Newton encountered. It simply implies that variables are related in a necessary and invariant way. Thus the radii of orbits of the planets, their periodicities, and their masses are related functionally, and the relationships cannot be other than what they are. Only a pre-Newtonian would say that the gravitational pull of the sun causes the planets to stay in orbit. (p. 32)

The horse is thought by some to be so dead that all that remains is removal of the cadaver. Thus Earman (1976) asserts that "the causation of which philosophers so fondly speak . . . lies moldering. The least we can do at this late date is to give it an honest burial." (p. 6)

But, as in another famous case, the reports of causality's death appear to have been greatly exaggerated. Consider the following evidence:

- Robert Ennis (1973), mounting a strong argument for the centrality of the concept of causality in educational research, deplores what he sees as a tendency to be reluctant in the use of "explicitly causal language." He cites as examples of euphemisms such phrases as "'brings about,' 'results in,' 'produced,' 'contributed to,' 'helped,' 'effected,' 'affected,' and 'consequence.' Two less obvious examples are 'taught' and 'teach,' as in: Ms. Kent taught Frank to be honest. The most effective way to teach reading is to combine look-say and phonics instruction in varying patterns to fit each individual child." (p. 14)

- Myles Brand (1979), in a fine analysis of various approaches to causality on which we shall lean heavily below, is able to be optimistic about the future of causality despite the fact that his analyses indicate serious problems with every contemporary formulation. For example, in discussing the activity approach, he says, "Despite these criticisms, I for one continue to feel the force of the intuition that causality is an anthropomorphic notion. Let me suggest an avenue of future research for this approach." (p. 260) Or again, in dealing with the counterfactual approach, he says, "Much of the work on this project remains to be done, and despite my own pessimism, may well be successful." (p. 269) He ends his analysis by calling for a group effort for philosophical research on causality, saying, "I am aware of the pitfalls . . . difficulties of group dynamics, the expenditure of time required for writing committee reports, the difficulty in funding such a project; nevertheless, in the case of causality it is a method whose benefits, I suggest, will outweigh its costs. (p. 275)

- Cook and Campbell (1979), while acknowledging that causal epistemology is "in a productive state of chaos" (p. 10), nevertheless assert that their book

> is intended to help persons who conduct both basic and applied research, who have already decided that they want a causal question answered . . . Although we discuss sampling and measurement issues implicated by the context surrounding causal questions, we are more concerned with the experimental designs and statistical analyses that facilitate causal inference. (p. 2; emphases added)

Clearly, despite Travers' strong disclaimer, there are many researchers who do not hide behind euphemisms or shrink from calling causality by its right name. Causality is still with us and indeed, is strenously called for by leadership figures in the field.

What is the Nature of Causality?

We turn, then, to the question, "What is the nature of this concept of causality which is so pervasive and to which so many persons seem to be so unswervingly dedicated? And there, to coin a phrase, is the rub. Far from there being simply some minor disagreements about how the concept should be defined, as for example, one might argue about whether the most productive way to view personality is in terms of attitudes, conscious or

unconscious motives, perception, cognition, personal organization, and the like (which are, after all, not incompatible notions), there are fundamentally different, often conflicting views about the nature of causality. Brand (1979) describes six different formulations, all of which have serious deficiencies, at least in the eyes of epistemologists other than their advocates.

These six more or less contemporary formulations (we use the term contemporary loosely, since the first "modern" formulation dates from the first half of the Eighteenth Century) represent, first, rejections of earlier, common-sense formulations, and later, efforts to produce definitions free of the problems noted by critics of their precursors.

Prior to the Eighteenth Century, little formal attention was paid to the concept. Aristotle had described his four causes, material, formal, efficient, and final,[1] but almost everyone continued to think of cause in the terms in which even modern dictionaries define the term, viz., a cause is that which produces an effect. This idea is often referred to as the "push-pull" or "push-from-behind" version of causality, exemplified by the action of a second billiard ball upon being struck by a first.

David Hume (1711-1766), a Scottish philosopher, took issue with this simplistic formulation, point out its logical Achilles heel: that there is no necessity for the second billiard ball to move when it is struck by the first. The fact that the second moves each time it is struck by the first is no guarantee that it will also move on the N + 1st observation. Further, no one ever "sees" a cause; that fact that C is always followed by E is not a sufficient reason to assert that C is the cause of E; such

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[1]For example, the material cause of a chair is the metal, wood, and other "stuff" out of which it is fashioned; the formal cause is the "idea" or "mental picture" of the chair held in the mind of its maker; the efficient cause is the agent, the furniture-builder, who actually constructed it; and the final cause is the purpose held in mind for a chair that promoted its building--to have something upon which to sit.

an assertion is an inference, or, we might say, an imputation or attribution.

Hume proposed a reformulation which has come to be known as the positivist view; virtually all more modern formulations can be viewed as extensions--or as rejections--of it. Hume proposed three conditions that must be met to justify an inference of causality: temporal precedence, physical contiguity, and constant conjunction or recurrent regularity. Following Brand (1979),[2] this positivist view may be formalized as follows:

For every event C and every event E, C caused E iff:[3]

(1) The occurrence of C began before the occurrence of E;

(2) C occurred in the immediate geographic area of E; and

(3) For every event similar to C that occurs, there is some event similar to E that occurs in the immediate geographic area and after it.

This Humean formulation has some serious problems. First, it does not account for simultaneous cause-effect relationships, as for example, that Bobby goes up on the teeter-totter at precisely the same instant that Lucy goes down. We may also note the impossibility of separating cause from effect in this instance; does Bobby go up because Lucy goes down, or does Lucy go down because Bobby goes up, or is there some other unidentified factor that causes both? Thus the condition of temporal precedence is immediately challenged. Second, the formulation does not account for that bugaboo of the Eighteenth Century physicist, action at a distance, as for example, the action of the moon in influencing tides or the action of electromagnetic fields. So the condition of physical contiguity is also suspect. Third, the condition of recurrent regularity

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[2]The form of this definition and of those cited in subsequent paragraphs is virtually identical to Brand.

[3]Read "iff" as "if and only if."

or constant conjuction is quickly seen to be, at best, a statistical argument, that cannot rule out coincidences or invariant sequences (such as the fact that night always follows day), nor can it handle the case in which two correlated effects are both produced by another, unidentified cause. (This last set of remonstrances is so well understood that almost any beginning student of statistics will mark "True" the test item, "Correlation does not imply causation.") Finally, as Hume himself appreciated, none of these conditions can account for the fact that people often identify causes on only one observation of a relationship, apparently a lengthy series of observations confirming that E always follows C is not necessary to lead to the inference that C causes E. People clearly can bring some mechanism to bear that provides, for them, a warrant for the causal inference even in the absence of the full array of information that Hume would require.

An effort to avoid the more serious objections to Hume is often termed the deductive-nomological approach. Proposed by such theorists as Carl Hempel and Karl Popper, the nomological position is well stated by Popper (1959):

> To give a casual explanation of an event means to deduce a statement which describes it, using as premises of the deduction one or more universal laws, together with certain singular statements, the initial conditions. For example, we can say that we have given a causal explanation of the breaking of a certain piece of thread if we have found that the thread has a tensile strength of 1 lb. and that a weight of 2 lbs was put on it. If we analyze this causal explanation we shall find several constituent parts. On the one hand there is the hypothesis: 'Whenever a thread is loaded with a weight exceeding that which characterizes the tensile strength of the thread, then if will break;' a statement which has the character of a universal law of nature. On the other hand we have singular statements (in this case two) which apply only to the specific event in question: 'The weight characteristic for this thread is 1 lb.,' and 'The weight put on this thread was 2 lbs.' (pp. 59-60)

Brand (1979) formalizes this approach as follows:

For every event C and every event E, C caused E iff:

(1) The occurrence of E did not begin before the occurrence of C began; and

(2) That E occurred follows from

(a) a statement of the laws of nature;
(b) a statement of the initial conditions; and
(c) a statement that C occurred;

but not from any two of these statements.

This definition is an improvement on the Humean in at least one respect: it does not require temporal precedence of cause before effect, but permits simultaneity (statement 1). But it is by no means free of other problems. Critics suggest that this view is a tautology, for laws--to be laws--depend on causal relationships themselves. Further, not all natural laws express causal relationships, some express only concomitance, as in Boyle's law, $PV = k$ (at constant temperature). Thus to use the nomological approach requires *a priori* knowledge of which laws are causal in form and which are not. Further, some natural laws are very loosely constructed, so that many conditions must be stated in order to use them for the purpose of making causal inferences--a circumstanct that reduces one's confidence that a causal relation has in fact been captured. Even worse, this formulation no more than the positivist fails to rid one of the feeling that significant human factors not accounted for in the formal definition come into play in making causal inferences; thus, experience and judgment are required to determine when a law may be applicable and whether the named conditions are sufficient. It is obvious, indeed, that humans can identify causes *without* laws altogether, as in the case of the automobile mechanic who diagnoses and cures an engine problem

without recourse to the engineering principles on which it is constructed. Finally, just as Hume believed that the concept of causality might not be "real" since it is always an inference of a human observer, the nomological approach also provides a reason for rejecting causality altogether, viz., that the approach can always result at least in statistical prediction and thus there is no need to get involved with "messier" questions of whether causality does or does not underlie the predictability.[4]

Fascination with the question of conditions is not limited to nomologists; some epistemologists approach causality entirely from the point of view of determining the conditions necessary and sufficient to warrant a causal claim. This school of thought is frequently called the essentialist. Essentialists such as John Stuart Mill and J. L. Mackie argue that a causal explanation is given when the set of conditions both necessary and sufficient for it to occur obtain. Turning again to Brand (1979) for a formal statement:

> For every event C and every event E, C caused E iff:
>
> (1) The occurrence of E did not begin before the occurrence of C began;
>
> (2) The occurrence of C is necessary and sufficient for the occurrence of E (that is, if C then E, and without C, no E), and
>
> (3) The occurrence of C is causally prior to the occurrence of E.

The third statement should be understood to mean that if both C and E are not determined at some point in time (as might be the case, for example, if C were itself the effect of some other cause that had not yet occurred), C must be fixed (determined) before E is. Or, to put it another way, causes and effects stand in deterministic relationships and

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[4] It may be this kind of thinking that underlies the suggestion by Travers, cited earlier, that we abandon the idea of causality and replace it with the idea of "functional relation."

therefore the cause must be deterimined before the effect can be determined.

Several serious logical criticisms can be made of this formulation. First, as Brand (1979) points out, the phrase "necessary and sufficient" is in set theory both symmetrical and transitive, so that C can be viewed within this formulation (even if only in a trivial case) as causing itself' violating the role of asymmetry which provides that effects cannot precede causes. Second, the third condition cited above, intended (although it does not do so adequately) to overcome the causal asymmetry problem (causes precede effects), introduces another difficulty, namely, that it ultimately denies determinism (if an event is to be unfixed, there must have been some time in which the state of the world did not require its occurrence).

But there are other, less esoteric, difficulties. First, the approach is reductionistic. Consider Blanshard's example (cited in Abel, 1976) of deciding on the causes of malaria:

> We say that malaria is caused by the bite of the anopheles mosquito. But the bite does not in fact always produce the disease, so the cause must be not the bite, but the actual release of plasmodia into the bloodstream. But, again, malaria does not inevitably ensue, so the cause must be the attack by the plasmodia on the victim's red blood corpuscles. Malaria is still not inevitable, however, so the cause must be the loss of hemoglobin. But even this does not always produce malaria, so the cause must be that the tissues are deprived of oxygen. But this last "cause" of malaria is just what malaria is! Thus, what we do in sorting out causes and effects is to impose an intelligible structure of discrete events upon the continuous stream of occurrence; we do it in the way that is most useful for our purposes.

Thus, the search for necessary and sufficient causes leads the inquirer to more and more atomistic levels in what approaches an infinite regress. It is for this reason that essentialists are sometimes described as "micro-mediational:" that is, they need to deal with mediations at the

finest levels possible in order to substantiate a claim of having uncovered necessary and sufficient conditions. Further, we might point out, the essentialists must require that cause and effect occur simultaneously, since, if there were even a tiny temporal gap between cause and effect, the possibility would exist that some other undetected condition had intervened that was really responsible for the effect.

Second, there is the matter of over-determinism, by which is meant the possibility that there are multiple conditions any of which may be sufficient to produce an effect while none alone may be necessary. Consider the claim, "The short-circuit caused the fire." Clearly short circuits are not necessary to cause fires; fires can be caused in many ways. And even sufficiency may be in doubt. Thus, the short circuit is not sufficient to start a fire in the absence of oxygen (indeed, fires cannot be caused by any means in the absence of oxygen). Thus the possibility always exists that some unrecognized factor like oxygen is necessary, leaving the essentialist approach an indeterminate one.

Finally, and for our purposes perhaps most importantly, the essentialist approach cannot be rid of human influences any more than others. To determine whether a given condition is necessary or sufficient depends on prior knowledge and judgment, as well as the ability either to know that no other causes are present or to be able to rule them out. Such human actions go beyond the elements contained in the formal definition. Nor should we lose sight of the significance of Abel's observation (quoted above) that "what we do in sorting out causes and effects is to impose an intelligible structure of discrete events upon the continuous streem of occurrence; we do it in the way that is most useful for our purposes." Thus, focussing on the role of the mosquito in the "causal chain" is useful

if we intend to prevent malaria by eradicating mosquitos, but as virologists we might elect to focus on the interaction of plasmodia and hemoglobin. The paraphrase Abel, we impute or attribute causality in the way that is most useful for our purposes, not necessarily in ways that conform with "reality." Indeed, the essentialists' reductionist approach makes it clear that there is a serious question of whether there is any reality at all in causal claims, for finally cause and effect become inseparable.

A fourth approach among epistemologists seeking to define causality is commonly called the activity or manipulability approach. Authorities such as Bertrand Russell, R. G. Collingwood, and Michael Scriven have chosen to focus on the everyday experience that effects are usually produced by manipulations of some kind, as throwing the switch causes the lamp to light. Moreover, these interventions (manipulations) have human agents. Thus causal relations can be inferred from human interventions.

Brand (1979) has formalized this activity approach as follows:

For every event C and every event E, C caused E iff:

(1) The occurrence of E did not begin before the occurence of C.

(2) There is a person P such that P used a manipulative technique (e.g., an experimental manipulation) for making C occur, and E occurred.

As we have by now come to expect, there are a number of serious objections that can be raised. First, the formulation is clearly anthropomorphic, rendering the concept of causality meaningless in the absence of human intervention, and attributing human qualities and characteristics to cause-effect relationships. However, it is worth noting the dependence on human mechanisms in this explanation, a theme we have commented on in other formulations and to which we shall return later. Second, from

a strictly logical point of view, the idea of P using a manipulative technique itself has causal overtones, so that the activity definition is "doubly causal," one might say, tautological. Third, while focusing on the agency of causality, the activity approach fails to account for the connection between cause and effect; why the particular manipulation produces the effect is unexplained. Fourth, this information does not account for those effects, as traditionally defined, that occur without human intervention, as for example, the moon causing tides. Finally, the activity approach is no more convincing than the essentialist with respect to cases of over-determinism, that plethora of sufficient but individually unnecessary conditions that is the bane of researchers everywhere.

A fifth approach to causality is the counterfactual formulation, akin to the indirect proofs embraced by mathematicians when direct proofs are unforthcoming and to the statistician's formulation of null hypotheses when in fact he wishes to test certain alternatives. This approach, espoused by authorities such as David Lewis and Robert Stalnaker, is based on the view, originally proposed by Hume, that if the cause had not existed, the effect would not exist either. Brand formalizes this stance as follows:

> For every event C and every event E, E causally depends on C iff E would not have occurred if C had not occurred.

This formulation, similar to Mill's (1843) "method of difference" which asserts that without C there can be no E, is deficient in a number of respects. It does not deal with the matter of temporal precedence, now with over-determinism--a criterion, it should be noted, which begins to loom larger and larger because it can be cited so often against the claims of various approaches. More directly, the relationship implied by

the formal definition is much broader than mere causal dependency. Consider Kim's (1973) example: that Socrates' drinking of the hemlock, while related to Xanthippe's widowhood, can hardly be argued to have caused it. But the counterfactual, that without Socrates' drinking the poison, Xanthippe would not have been widowed, is surely true.

Mill understood that the method of difference was not enough; he urged also application of the "method of agreement" (if C then E) and the method of concomitant variation. But he also pointed out that affirmative findings by even all three methods was not enough; he warned that one must also be able to affirm a logical relationship between C and E (that is, correlation does not imply causality). Again the need for human intervention may be noted.

A final approach to the problem of defining causality in meaningful terms is labeled the probabalistic. Wesley Salmon, Hans Reichenbach, and Patrick Suppes as epistemologists, and a whole host of statisticians lean heavily in this direction. Nurmi (1974) (not an advocate) states the position as follows:

> On purely intuitive grounds it appears plausible to assume that causal connections affect the conditional probabilities of events. In other words, causal factors are usually considered as statistically relevant. Particularly within the social sciences where it is widely agreed that we cannot possibly take into account all relevant causal factors affecting given phenomena, the focus on probabilities is usually viewed as necessary even if an in-principle deterministic ontology of social phenomena is assumed. In this case probabilities just express our ignorance of all the causally relevant factors. (p. 26)

Brand (1979) formalizes this approach as follows:

For every event C and every event E, C caused E iff:

(1) E is later than C;

(2) $P(C,E) > P(E)$; and

(3) There exists no event D such that D is earlier than or simultaneous with C and D screens off C from E.

"Screening off" means that D renders C "statistically irrelevant" to E, that is, statement 3 militates against the existence of a factor that operates on C in such a way that the probability of E is the same irrespective of the occurrence or non-occurrence of C. An example cited by both Reichenbach and Salmon is the falling of a barometer prior to the coming of a storm. Without statement 3 the barometer's fall might be taken as the cause of the storm, but another event, the drop in atmospheric pressure (simultaneous, in this case, with the barometer's fall), screens off the effect, the storm, from the drop in barometric pressure, thereby rendering the claim that the falling barometer is the cause of the storm invalid.

This approach, like the others, founders on several grounds. First, it repeats the difficulty noted with some of the earlier formulations in requiring that causes have temporal precedence over effects. Second, it does not distinguish between causes and other conditions, such as the necessity for oxygen if the striking of a match is to cause ignition. Third it does not deal with asymmetry; the earlier cited example of the teeter-totter cannot be handled since the probabalistic approach allows interchange of cause and effect (Bobby going up and Lucy down is equivalent to Bobby going down and Lucy up). Finally, the formulation defeats the basic notion of invariant accompaniment of cause and effect, that is, it essentially denies determinism which is, however, precisely what persons who wish to answer causal questions are most interested in.

Nurmi (1974) concludes that

> . . . it can be maintained that probabalistic approaches to causality fall short of giving adequate support to causal statements, either because of their credo concerning the ultimately deterministic nature of causal connections in

> which case the analysis ends up with universal causal laws and no account can be given of improbable causal connections, or because of their unrealistic presupposition of fixed probability space. There is no point in arguing against their applicability and analytic value if the contextual requirements can be unambiguously fulfilled. However, social causal analysis very rarely can take these requirements for granted. Furthermore, strictly speaking changes in conditional probabilities provide no support for causal statements per se. Statistical relevance may or may not be an indicator of causal connection. Only in relation to the view of causality as a lawful connection can increase in conditional probabilities be considered as a clue for further causal inquiry. And even if this view is accepted, we need to know the modus operandi of causal connections in order to infer causal connections from probability statements (providing the latter can be assumed to be meaningful without assumptions concerning the causal connections themselves). (p. 34)

All this seems to us to add up to two things we have already encountered several times: (1) correlation does not imply causality, and (2), other information, experience, and/or judgment is required than is implied by the formal statements of a position in order to warrant causal inferences from probability information.

What Can One Conclude from this State of Affairs?

Several broad conclusions can be deduced from the state of affairs which we have described:

1. The concept of causality is so poorly established that it strains credibility to continue to entertain it. Every proposed formulation has serious difficulties, and some difficulties are so pervasive that they seem to apply to all formulations. Among the problems that have been identified, and that continue to be intractable, are these:

   - The criteria of temporal precedence and asymmetry that have guided most causal epistemologists are being seriously challenged. These criteria require that effects cannot be their own causes and that effects cannot precede causes; yet it seems apparent that the possibility of simultaneous causation and even backward causation must be taken seriously (consider the difficulties produced by relativistic physics which warps time in ways not contemplated by classic epistemologists; see Mackie, 1974).

- The criterion of recurrent regularity, a mainstay of causal epistemologies since Hume, is also subject to serious challenge, for it essentially poses a statistical argument which cannot rule out coincidence or invariant sequences and which is, in any event, itself subject to the restriction that correlation does not imply causality.

- Some causal epistemologies appear to be tautologies, defining causality in terms of itself, as in the common sense definition that a cause is that which produces an effect; in the nomological approach in which selection of a law from which causality may be deduced depends upon knowing a priori which laws are causal; and in the activity approach which is based on "double causality" by depending upon a manipulative act carried out by a human agent.

- Some causal approaches, notably the probabalistic, and to some extent the essentialist, actually are in the position of denying determinism as a result of the axiomatic structure which they adopt, but determinism is the essence of what causality is about.

- Causes seem to be hedged about with many conditions that prevent "clean" causal claims from being made, a difficulty especially troublesome to the essentialist and nomological approaches but also embarrassing for any approach that requires temporal precedence, since it is always possible that some unidentified conditions may have intervened in the time gap between cause and effect.

- Virtually no existing formulation can handle the problem of overdeterminism. There appears to a plethora of sufficient causes for virtually any effect, but hardly anything one can identify as a necessary cause.

2. The difficulties summarized above have implications for all scientific investigations, but especially for human, that is, social/behavioral inquiry. Consider:

- It seems clear that humans are anticipatory beings. They may produce an "effect" in anticipation of the cause, so that the effect may literally precede the cause. It is often asserted among epistemologists that "the system ought not to jump until it is kicked," but humans jump at odd times. Furthermore, the human may select that cause from among multiple possible causes that will in fact influence his or her behavior. Thus the ideas of temporal precedence and asymmetry become highly questionable.

- Human behavior may exhibit a great deal of recurrent regularity that cannot be ascribed to causes. For example, most humans tend to follow the same patterns of behavior (these are often called habits) on arising in the morning and getting ready for the office, but it would be absurd to label any given activity in such a sequence as the cause of the next. Most particularly, recurrent regularities have different meaning at different levels; thus the fact that a woman describes symptoms to her gynecologist that, in 80 percent of all cases, indicate cervical cancer, is not a sufficient reason to schedule her at once for a hysterectomy.

- The implicit denial of determinism by some approaches seems to be a positive good when studying human beings, who are often thought of as displaying free will. The notion of a fully determined human has been repugnant throughout all of the years ofpsychological and sociological inquiry (and most of us would reject the concept as applying to our own behavior), but it has been accepted in principle because no other formulation seemed to support the kind of inquiry that was going on. The rejection of causality frees inquirers into human phenomena from the burden of deterministic assumptions.

- Human phenomena seem to require even more conditional stipulations than do others. We have argued in other writings (Guba and Lincoln, 1981; Guba and Lincoln, in press; Lincoln and Guba, forthcoming) that human behavior is impossible to generalize precisely because it is so intimately bound to particular times and contexts. Hence the hope that "clean" causal statements might be developed is vain.

- Overdeterminism seems to be the overriding condition of humans, in the sense that there are always a multitude of factors impinging on and interacting with them. To select one or a subset of these factors as the causes of some particular human behavior is fatuous.

3. It has proven to be impossible to divest the concept of causality of influences depending on human experience, judgment, and insight. Literally no formulation has been forthcoming that does not at some point depend on these matters. Consider:

- Hume (and positivists generally) moved to deny the viability of the causal concept on the grounds that causes were always imputations made by an observer to "explain" a relationship, as for example, that a second billiard ball moved when struck by a first. Moreover, Hume recognized the inadequacy of the recurrent regularity criterion

to explain the fact that people can sometimes correctly ascribe causality after seeing only one instance of a phenomenon.

- Mill proposed three methods for assessing causation--the method of agreement, the method of difference, and the method of concomitant variation--and then went on to say that, of course, one must also be able to "affirm a logical relationship" before a causal claim was warranted.

- Essentialists understand that human judgment is required to determine when a condition is necessary and sufficient, and to know that no other causes are present that might account for the noted effect (hence their press for micro-mediation).

- Nomologists agree that human judgment is necessary to decide when a law is applicable and whether the specified initial conditions are adequate to warrant a causal claim.

- The activity approach is essentially anthropomorphic and its axiomatic structure requires the intervention of a manipulating agent (human).

- Abel (1976) in his book Man is the Measure (we may note the appropriateness of the title to the argument being made here) has pointed out (see quotation above) that the imputation of causes is an "imposition" of a structure selected to be "most useful for our purposes" and not because of its inherent naturalness.

- Ennis (1974) proposes the concept of "responsiblity ascription" (loosely defineable as "that the maker of a specific causal statement is claiming that under the existing conditions the specified cause was sufficient to bring about the effect, and that it was responsible for the effect," p. 10) but points out that "responsibility ascription involves the cause identifier in the making of value judgments," p. 11.

- Cook and Campbell (1979) conclude that "the concept of causality is closely linked to intentions and purposes. Most causal inferences are about attributes of the world that are particularly relevant to an active, intrusive, willful organism." (p. 30)

4. As a result of the above, we propose that the concept of causality be abandoned (or, as Bertrand Russell, 1913, put it, "expunged") and replaced with a formulation that takes account of the difficulties noted, has special relevance to human phenomena, and explicitly recognizes

that human experience, judgment, and insight are inextricably involved. Abandonment is not, of course, the only possible response to the state of affairs that we have described. Cook and Campbell (1979), for example, opt for an "evolutionary" perspective which they dub the "critical-realist," while another approach receiving wide advocacy is to regard causality as attributional. We may examine these two concepts briefly.

Cook and Campbell (1979) describe the critical-realist perspective as follows:

> Such an evolutionary perspective, when couched in a critical realist mode, enables us to recognize causal perceptions as "subjective" or "constructed by the mind;" but at the same time it stresses that many causal perceptions constitute assertions about the nature of the world which go beyond the immediate experience of perceivers and so have objective contents which can be right or wrong (albeit not always testable). The perspective is realist because it assumes that causal relationships exist outside of the human mind, and it is critical-realist because it assumes that these valid causal relationships cannot be perceived with total accuracy by our imperfect sensory and intellective capacities. And the perception is evolutionary, because it assumes a special survival value to knowing about causes and, in particular, manipulable causes (p. 29)

We do not find such a construction compelling. First, we have already seen that a concept of causality that resides in an exterior, objective world is simply not tenable. Every such formulation suffers from crippling deficiencies; moreover, it has not been possible to divest even one of them from the need for human imputs that were not contemplated in its axiomatic structure. Second, we doubt on other grounds the imputation of "reality" to human behavior; the concept of a single, tangible reality onto which inquiry can converge seems to us untenable when it is a social/behavioral phenomenon we are investigating (Guba and Lincoln, 1981; Guba and Lincoln, in press; Lincoln and Guba, forthcoming). Third, we are unconvinced by the argument of ignorance; it seems to us at least as

reasonable to suggest that we do not "perceive" causal relationships properly because they do not exist as to excuse ourselves on the grounds of "imperfect sensory and intellective capacities." Finally, we agree that it would be very helpful to know about causes, especially manipulable causes (if they exist), in the interest of improving our survival chances, but it will not do to wish the concept into existence simply because it would be nice to have it. "If wishes were horses, beggars would ride," and apparently, "If wishes were causes, researchers would be able to control everything." But neither of these conditionals is likely to obtain; it seems more sensible, finally, to confront the situation realistically, to eschew the pleasure principle, and to move boldly off into new directions.

What of the movement to transform the theory of causality into an attributional theory? It appears that as the concept of causality as "real" or "natural" loses credibility, and the influence of human judgment and experience in leading to valid causal statements becomes more and more appreciated, a tendency is emerging to describe causality as entirely attributional ir imputational.[5] We seem to have come full circle to Hume, who based at least a part of his critique of classic notions of causality on the fact that no one ever saw a cause but only inferred it from some observation which as interpreted to be an effect. It is pointed out that such imputations have roots in the semantics of the situation, as for example, that in the statement that "Treatment A is effective in producing Effect X," any causal interpretation clearly depends on how Treatment A, Effect X, and the term "effectiveness" itself are defined.

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[5] An extensive literature on attribution theory has emerged. The classic reference remains Jones et al. (1972).

At first glance attributional formulations seem to be attractive to the naturalist position. It is a naturalistic axiom (Guba and Lincoln, 1981; Guba and Lincoln, in press; Lincoln and Guba, forthcoming) that realities are multiple and constructed; the idea of attributed causes seems to fit well with the idea of constructed realities. It is as though we had shifted from the classic, "For every effect a cause," to the counterpart, "For every constructed effect an attributed cause." Another naturalistic axiom is that of the interactivity between inquirer and respondent (or object of inquiry), which also lends support to the notion that causal imputations may very well exist only in the mind of the investigator, arising because of his/her interaction with the phenomenon being studied.

But it should be noted--and this is a crucial point--that attributional formulations, while denying the reality of causal explanations, nevertheless continue to treat them as having utility. It may not be wise to treat causes and effects as existing "out there," but it is still useful to act as if causes and effects existed. It is a convenient way to conceptualize the world and materially assists those who wish to predict and control ongoing events.

But we take the position that to persevere in using the concept of causality even in only that limited sense is ultimately misleading. Just as scientists have ultimately had to give up "placeholder" theories like phlogiston or ether, so, we suggest, it is time to give up the placeholder theory of causality. Indeed, if Hume and the many others since who have noted the inescapable influence of human judgment and insight in the development of causal statements are right, it is quite possible that all that have ever existed are variations on an attributional theory of

causality, not quite recognized as such. It is possible and credible to argue that the many criticisms that can be and have been mounted against the various formulations of causality must have been directed, even if we did not always realize it, against just those attributional theories. It does not matter, in that sense, whether causality is real or attributed; the criticisms are nevertheless valid and telling. Thus, whichever position one takes, it seems clear that neither "real" nor attributional theories of causality have much utility. It is certainly time to abandon, yea, expunge, the concept of causality and to begin thinking about the world in other terms.

If We Reject Causality, With What Shall We Replace It?

If it is proposed to replace the concept of causality with something else, in seems sensible to ask, "Why would we want to replace it with anything at all? What does the concept of causality do that is so valuable that we think twice before abandoning it?" Recall, please, the opening paragraphs of this essay, in which the question was raised why the history of inquiry is characterized by such an obsessional preoccupation with causality. The reasons suggested there (but with no claim that these are surely the reasons) included these: that it is the aim of science to achieve control; that ability to control is the basis of power, and indeed, if Cook and Campbell may be believed, the very key to survival; and that the drive to develop causal explanations is generated at deep levels in our psychological and perhaps even our genetic make-up. These are strong reasons indeed; if abandoning the concept of causality will in fact deprive us of these benefits, we had best be convinced on very good grounds that such a move is really in our best interests.

The evidence we have adduced thus far seems to us to provide those good grounds. Fet we are hesitant to break away completely from the search for a way of dealing with the world that will accrue these benefits, or at least, something approximating them. Is such an intermediate goal possible to achieve? We believe that answer to that question is "Yes." We believe that an appropriate replacement concept is that of plausibility--understood in its rational and not its statistical sense--and we assert that the concept of plausibility can substitute understanding for prediction and control, adeterminism or non-determinism for determinism, and an open universe in which there is always some doubt for a closed one in which, given sufficient knowledge, it is possible to delineate everything with precision. Einstein was right when he asserted that "God does not throw dice." but on the other hand, God--or Mother Nature, if you prefer--is no more a precise mathematician than a risk-taking gambler.

What is needed to guide our thinking is a new mataphor to replace X that of the grand machine with its multitudinous linkages--and note that it matters little whether those linkages are mechanical or more sophisticated gravitational, electronic, or nuclear strong force analogs. Some possibilities come quickly to mind: web (as in web of circumstances), net (as in communication net) and pattern (as in pattern of influences).

Perhaps the most powerful metaphor, however, is that interconnected mass of neurons called the brain. Within the brain every neuron is connected to every other neuron in a seemingly trackless fashion. An arm is raised, a memory is called up, a difficult problem is solved; but who can say in what pattern of neuron firings that result was accomplished? Raise the

arm again, recall the same memory, solve the same problem; and who can say whether the same neurons and the same sequence of firings were involved? Indeed, extirpate part of the brain--the part you believe to be causally involved, if you like--and often other parts can, at least after a time, take over to produce the movement, the recall, the problem-solving behavior. We know that at times we can teach the right brain to perform left-brain functions, and vice-versa.

The key idea is mutual, simultaneous shaping. Everything influences everything else, in the here-and-now. Many elements are implicated in any given change, and each element interacts with all the others in ways that change them all while simultaneously resulting in something which we, as outside observers, label as outcomes. But the interaction had no directionality, no need to produce that particular outcome; it simply "happened" as a product of the interaction. All elements involved are "contingently necessary" (Nurmi, 1976) in the sense that they participate in a synergistic relationship that activates them all. The resulting shaping is, furthermore, "circumstances relative" (Ibid.) in that there is a plurality of shapers (over-determinism) with each becoming meaningful in ways that depend on varying circumstances or conditions.

The concept of plausibility which we propose involves the recognition that:

- All elements in a situation are in mutual and continual interaction;
- Each element is activated in its own way by virtue of the particular configuration of all other elements--potential shapers--that is assumed at that time and in that place;
- Judgments about which of the potential shapers may most plausibly by implicated in explaining whatever it is the investigator wishes to explain is a matter both of

the circumstances that exist and of the investigator's purpose; the investigator asks himself, "What is most plausible to invoke given that purpose?"

- The peculiar web or pattern of circumstances that characterizes a given situation may never occur in just that way again, so that plausibility judgments are unique and cannot be understood as implying either predictability or control; and

- Plausibility assertions are here-and-now accounts that represent a "photographic slice-of-life" of a dynamic process that, in the next instant, might present a very different visage.

This formulation, we assert, has two major advantages. First, it is consistent with the five axioms of naturalistic inquiry, which we have explicated in detail elsewhere and have asserted to be more appropriate to guide inquiry in the social/behavioral sciences than are the axioms of the rationalistic (or scientific or conventional) paradigm (Guba and Lincoln, 1981; Guba and Lincoln, in press; Lincoln and Guba, forthcoming). Thus:

- The axiom of multiple, constructed realities is served in that the concept of plausibility allows for an infinite variety of situational mixes and purposeful imputations by the investigator, imputations that may, moreover, change as other constructions are uncovered and appreciated;

- The axiom of inquirer-object dependence is served in that the inquirer arrives at plausible explanations through an interaction of his investigatory purposes with the unique characteristics of the situation;

- The axiom of limited generalizability (transferability) is served in that determinism is abandoned and neither prediction nor control is claimed to result from plausible imputations, except in very similar times and contexts;

- The axiom of value-boundedness is served in that the values of the investigator are clearly evident in the choice of plausibility assertions (indeed, the investigator's purposes must be explicit), and contextual and respondent value-resonances are assured by virtue of the recognition of those values as part of the general shaping process; and

- The axiom of explanation of action (causality), which is the specific target of this paper, is served in that the concept of causality is replaced by the concept of plausibility.

A second advantage of the plausibility formulation is that it obviates most of the difficult problems associated with conventional causality formulations. Thus:

- The issue of determinism disappears. It is not necessary to posit determinism or even an "in-principle deterministic ontology" while dealing with phenomena probabilistically because of "imperfect sensory or intellective capacities." The concept of sorting out plausible mutual shapers obviates the need to label some elements as "causes" and others as "effects."

- The issue of temporal precedence disappears. All elements are seen to be in continuous and mutual interaction; we are no longer required to sort matters out into a causality chain in which some elements must necessarily precede others.

- The issue of over-determinism disappears. There is no longer a plethora of sufficient but not necessary causes but an infinite number of mutually interacting shapers. There is no need to sort these shapers into causes and non-causes, nor into necessary but not sufficient or sufficient but not necessary causes.

- The requirement of recurrent regularity disappears. The plausibility assertions are not statistical, and mutual shaping is allowed full sway without the requirement that some elements must inevitably be accompanied by others in order to permit a plausibility assertion to be made.

- The necessity for human judgments and interpolations to intervene in making plausibility assertions is not only not an embarrassment, but is elevated to the level of a precondition. The purposive, imputational nature of plausibility assertions is explicitly recognized.

- The conditional nature of plausibility assertions is also plainly noted. The "circumstance relative" nature of such arguments is an intrinsic part of the formulation. The need to try to take account of as many conditions as one feasibly can, rather that to identify just some few that can be characterized as necessary and sufficient, is manifest.

- The tautological nature of many causality formulations is obviated.

- The need to devise explicit formulations for intervening (sufficient) mechanisms disappears.

Of course there are difficulties with the plausibility concept which, no doubt, our critics will be quick to point out. The major difficulty we see is the establishment of criteria for determining when a plausibility assertion is "sufficiently" plausible to be persuasive. Of course good sociologists and anthropologists--recall de Tocqueville, Meade, Wax, Liebow, Whyte, Becker, Goffman--have made assertions, sometimes about whole cultures, that we do not find hard to accept, but there is a great difference between finding a statement persuasive and being able to say why it is persuasive. The development of appropriate criteria represents an intellectual task which is, at the moment, beyond us, but which, we are persuaded, will turn out to be doable. For the present, we suggest that these criteria have promise:

1. Groundedness. A plausibility assertion must be grounded in the situation from which it is drawn. It cannot be inconsistent with any element in that situation, and, so far as humanly and logistically possible, should take account of all situational elements. The assertion must be demonstrably grounded in the investigator's purpose as well. Recalling the earlier cited example on the "cause" of malaria, an environmentalist might offer plausibility assertions in relation to the control of mosquitos, a virologist with respect to characteristics of plasmodia, the hematologist with respect to the destruction of hemoglobin, and so on. Plausibility assertions that are not data-based and purpose-relevant cannot be taken seriously.

2. Internal consistency. A plausibility assertion must be internally consistent. This criterion is similar to that proposed by Eisner (1979)

and called by him "structural corroboration." Just as a mystery author must, in the book's last pages, propound a solution to the crime that takes account of the "facts" that have been presented in ways that make sense out of their totality, so must the inquirer propose probability assertions that can stand the test of cross-comparison.

3. Confirmability. The plausibility assertion should be able to withstand scrutiny from a variety of perspectives. Persons with different points of view should not be able to raise unanswerable objections, and the counter-assertions made by those with different perspectives should not prove to be more "powerful" in helping to understand the situation than is the assertion finally adopted by the investigator. Confirmability requires that an investigator seek out alternative explanations and examine them carefully light of the known information. Triangulation and cross-examination are key techniques.

4. Wholism. The plausibility assertion should give the appearance of being constructed from "whole cloth" rather than in some piece-meal fashion. It should provide the consumer of the inquiry report with a kind of vicarious experience, a feeling of deja vu, with respect to the subject of the investigation. The assertion should be inclusive rather than exclusive.

It is clear that these criteria are not sufficiently well developed, and may indeed turn out to be wrong-headed. A development of some criteria does appear, however, to be a methodological need of some importance.

An Epilogue

What we have tried to accomplish in this essay is to develop an argument for abandoning the concept of causality and replacing it with

the concept of plausibility. We have tried to make it clear that each of the conventional formulations of causality suffers from serious, if not fatal, deficiencies. We have proposed a new formulation which, we believe, has two major advantages: it is consistent with the axioms of the naturalistic paradigm of inquiry, which we believe to be the paradigm of choice in dealing with social/behavioral inquiry; and it obviates many of the deficiencies with which the causality concept is plagued. We have posed several preliminary, if primitive, criteria for determining when a plausibility assertion is sufficiently persuasive to warrant being taken seriously.

To some it may appear that the shift we have proposed is merely a semantic one. They may feel, echoing Ennis (1973), that we have done nothing more that to replace explicit causal language with weak euphemisms. But we believe that our proposal goes well beyond mere semantic convenience. Two examples may suffice:

Consider the present emphasis on the development of interventions for the alleviation or elimination of a variety of educational problems: curricular relevance, motivation, proper concern for the handicapped, appropriate treatment of women and minorities, and so on. Virtually the entire basis for the hope that interventions can be identified and developed is the idea that the conditions to be changed are <u>effects</u> and that interventions can be <u>causes</u> that will produce other, more desired effects. The plausibility argument makes it clear that this is a false hope. Interventions can be mounted, but without any assurance, regardless of prior evaluation, that they will in fact produce the outcomes hoped for. Indeed, all one can do is to introduce yet another "shaper" into the mix;

how this introduction will shape other elements in the situation, or how the intervention will itself be shaped by those elements, is a matter that can be settled only over time and with experience. The intervention may produce the desired outcome (and it may be possible to devise some plausibility assertions that will help us to understand why), but there is absolutely no a priori assurance that that will be the case.

Or consider how belief in causality itself shapes (if we may use that term) evaluations. We recently had the experience of working with a task force whose charge it was to devise ways of evaluating the effects of certain in-service teacher training workshops on the subsequent behavior of the children taught by the enrolled teachers. Imagine for a moment the causal chain implied by that charge. Workshops are planned with certain ends in mind. The plans are then put into effect, perhaps in multiple sites, in ways that more or less correspond to the plans, but which also deviate from them because of local exigencies. If several workshops are offered, they probably also differ in significant ways from one another as well as from the common plan. Now teachers attend these workshops, each coming with different levels of commitment, interest, training, and experience. These teachers, shaped in some way (and in turn shaping) the events of the workshop they happen to attend, return to their schools, each in its own social, fiscal, political, and cultural environment. The conditions and circumstances of the schools constrain some elements of whatever it is the individual teacher has brought back and reinforce others; moreover, the message the returning teachers may bear (and the enthusiasm with which they bear it) may influence local decision makers in differential ways, resulting in, say, greater or lesser support. Into the rooms of these teachers come the children, each with

his or her own differing levels of commitment, interest, and ability. There they are confronted by teacher actions shaped not only by all of the preceding factors but by the interactions with the children at the very moment of teaching. Finally, the children return to their neighborhoods and their homes, and there they behave in ways shaped to some extent, to be sure, by what they have learned from the teacher, but by a myriad of other shapers--such as parental expectations--as well.

Now consider the task: to be able to trace a causal chain whereby changes in pupil behavior can be unequivocally (deterministically) traced back to events that occurred during the in-service workshop! Consider the shapings that occurred at each step in this sequence, and ask whether it is reasonable to expect evaluators to sort all of these elements out. Ask whether it is reasonable to imagine that they can be sorted out into neat, micro-mediating cause-effect pairs! It does seem reasonable, however, to imagine that an evaluator might note some new behaviors from some child, and that, by making appropriate observations and gathering appropriate interview or documentary data, he or she could begin to weave a plausible argument about the utility of the workshop in helping to shape that child's behavior. Note, by the way, that it is equally reasonable to devise plausible arguments about how the children's behavior might shape the workshop, an outcome which in all likelihood was the reason for undertaking the evaluation in the first place.

We doubt that you have been persuaded by the arguments we have mounted here today. We are well aware of the enormity of what we are asking you to do: to lay aside a conceptual tool on which you were virtually weaned and which you have found enormously useful, and to accept instead what at first glance seems a much weaker and less effectual

idea. OUr purpose will have been served, however, if by our arguments we have planted the slightest seeds of doubt in your mind, or stimulated an interest in pursuing the matter further, even if only to prove us wrong.

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